CLAIMS

1. A cavity ring-down spectrophotometer comprising:

an optical cavity resonator having a first surface; and

a thin metal layer disposed on said first surface, said thin metal layer operable to receive a transducing layer.

2. The apparatus of Claim 1 further comprising a tunable coherent light source evanescently coupled to said optical cavity resonator.

3. The apparatus of Claim 2 wherein said tunable coherent light source is evanescently coupled to said optical cavity resonator using a prism.

4. The apparatus of Claim 1 wherein said optical cavity resonator has a polygonal shape.

5. The apparatus of Claim 4 wherein a face of said polygonal shape comprises said first surface.

6. The apparatus of Claim 4 wherein said polygonal shape is a square.

7. The apparatus of Claim 1 wherein said optical cavity resonator has a toroidal shape and is embedded within a substrate.

8. The apparatus of Claim 7 wherein a planar face of said toroidal shape comprises said first surface.

9. The apparatus of Claim 7 further comprising a first waveguide disposed in said substrate proximate to said optical cavity resonator operable such that optical energy in said first waveguide is evanescently coupled into said optical cavity resonator.

10. The apparatus of Claim 9 further comprising a second waveguide disposed in said substrate proximate to said optical cavity resonator operable such that optical energy in said cavity resonator is evanescently outcoupled into said second waveguide.

11. The apparatus of Claim 9 further comprising a tunable coherent light source for introducing light into said first waveguide.

12. The apparatus of Claim 1 wherein said transducing layer is operable to receive an analyte.

13. The apparatus of Claim 1 wherein said optical cavity resonator is comprised of SiO_2.

14. The apparatus of Claim 9 wherein said first waveguide is adiabatically tapered to improve evanescent coupling to said optical cavity resonator.

15. The apparatus of Claim 2 further comprising a heterodyne based detector optically coupled to said optical cavity resonator for coherent detection of weak signals.

16. The apparatus of Claim 1 wherein said optical cavity resonator is superpolished to achieve a high quality factor.

17. A method for making a cavity ring-down spectrophotometer comprising:

providing an optical cavity resonator having a first surface; and

depositing a thin metal layer on said first surface, said thin metal layer operable to receive a transducing layer.

18. The method of Claim 17 further comprising providing tunable coherent light source evanescently coupled to said optical cavity resonator.

19. The method of Claim 17 wherein said optical cavity resonator has a toroidal shape and is embedded within a substrate.

20. The method of Claim 19 further comprising providing a first waveguide disposed in said substrate proximate to said optical cavity resonator operable such that optical energy in said first waveguide is evanescently coupled into said optical cavity resonator.